Renewable and Sustainable Energy Reviews 16 (2012) 2988–2993

Contents lists available at SciVerse ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

# The willingness of hoteliers to adopt proactive management practices to face energy issues

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ARTICLE INFO

*Article history:*
Received 18 June 2011
Accepted 29 January 2012
Available online 22 March 2012

*Keywords:*
Environmental management systems
Energy conservation
Energy management

ABSTRACT

This paper examines the willingness of hoteliers, in Corfu Island of Greece, to invest in proactive energy management practices and environmental management systems to address energy problems. Three binary logistic regression models were estimated to identify those variables that affect hoteliers' willingness to install solar water heaters, air condition inverter and to adopt EMS. It is reported that in the hotel sector there is place for energy and management improvements. This can be achieved if specific information and fiscal incentives are applied.



**Contents**



## 1. Introduction

Energy is a very important factor for the operation of hotels. Ali et al. [1] reported that large amounts of heat and electricity are used by the tourism sector for lighting, water heating, air conditioning, and laundry operations. Energy requirements of Hong Kong hotel units were estimated approximately at 406 kWh/m$^2$ on average [2], which is a very high amount compared with other buildings.

Several studies have examined the energy management and performance of hotel units [3–5]. In particular, energy use intensity (EUI) of hotels in Singapore was reported 427 kWh/m$^2$. Considering the hotel category, it was reported that the energy use of three-star hotels was higher than high class hotels [5]. Becken et al. [6] explored energy consumption differentiations between a range of accommodation forms in New Zealand such as hotel, bed and breakfast, motel, backpacker, and campground accommodation. They found that hotels are the largest energy consumers in relation to other accommodation forms, using 67% of the total 1.74 PJ. Shiming and Burnett [7] identified that hotels in Hong Kong use a large amount of electricity, diesel and gas and proposed a series of energy management programs and energy conservation strategies for such hotels. Onut and Soner [8] examined the relationship between energy management and profitability of hotels in the Antalya region of Turkey. They found that only eight hotels, out of 32 examined, were energy efficient. Santamouris et al. [9] proposed a series of energy saving strategies and retrofitting techniques and estimated that annual total energy consumption in Hellenic hotels is 273 kWh/m$^2$ on average.

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doi:10.1016/j.rser.2012.01.061

A number of studies also examined different environmental management and energy practices. To this context, Baccali et al. [10] proposed a set of indices for measuring environmental and energy performance of different clusters of hotels. Furthermore, Rossello-Batle et al. [11] found that the hotel buildings had great environmental impacts on energy uses, $CO_2$ emissions and waste materials. Also, Bohdanowicz and Martinac [12] examined the differences in the energy and water uses in Hilton and Scandic hotels and identified a range of indicators including hotel standard, location/climate, facility size, occurrence of energy and water intensive services, number of guest-nights and others. Erdogan and Baris [13] studied the general status of environmental protection, waste management, purchasing, energy use, and conservation practices of hotels in Ankara and they found that there is lack of standard and efficient management practices to face energy issues.

Finally, studies on the level of awareness of energy issues and willingness to invest in additional energy practices of hoteliers have resulted in very different findings. For example, Bohdanowicz [14] identified that a range of geo-political and, economic and socio-cultural context of a country play a critical role in environmental awareness of hoteliers in Poland and Sweden. Ali et al. [1] identified that only a limited number of hotels in Jordan have already adopted energy management practices. In particular, 80% of hoteliers expressed their willingness to use energy efficient appliances and 95.2% of the five star hotels had undertaken a comprehensive environmental program in their hotel. Tzschentke et al. [15] explained that the factors that affect those decisions or preferences of hotels to invest in environmental or energy management practices could be classified in two categories such as costs savings and ethical dilemmas.

The low number of studies conducted so far on environmental management of the tourist sector indicates that more work is necessary to clarify the preferences of hoteliers to invest in proactive separate energy equipment or integrated environmental management to face energy issues. Furthermore, there is a limited number of work published dealing with factors affecting energy behavior. This paper aims to identify the willingness of Greek hoteliers in Corfu Island (Greece) to invest in specific energy management practices or environmental management systems to address energy efficiency. Because the tourist industry has similar strengths, weaknesses, opportunities and threats, we believe that these findings can be of help in other regions of the Mediterranean.

## 2. Research methodology

A fully structured questionnaire was created for the data collection. It consisted of face to face interviews by hoteliers in order to identify their willingness to invest in proactive energy management and environmental management practices to address energy needs. The sample, the questionnaire and statistical analysis are described as follows.

### 2.1. Sample

The survey focused on Corfu Island, located on the west coast of Greece in the Ionian Sea. Corfu Island is one of the most preferable tourist destinations of Greece. The island has 406 hotels, which represents 5% of the total number of Greek hotels [16]. A total of 91 valid questionnaires were filled representing 22.75% of the island's hotel population.

### 2.2. Questionnaire development

The questionnaire consisted of five parts. The first part included some introductory questions regarding the hotel characteristics. Then, the information level for energy savings and renewable energy sources were requested. Questions regarding electricity cuts and subsequent operational problems followed. The second part detailed specific scenarios to identify the willingness to install related equipment. The interviewer helped the respondent to calculate the cost equivalent for the hotel. The first scenario was about energy saving lamps. It was asked if energy saving lamps had been installed for those who did not have energy saving lamps a further question was asked: "*Suppose that the replacement of a 75 W lamp with an energy saving lamp costs 5€ and provides cost savings of 71€ throughout the life of the lamp (6 years), would you be willing to replace the lamps in the rooms and common space if this would cost in total...€?*".

Next it was asked if they had installed electronic cards in the hotel rooms for those who had not installed them a further question was asked: "Suppose that an electronic key card costs 120€ per room and results in electricity savings of 15% per season or 24€ per season. Considering that the installation of such systems is subsidized by 40% *and capital recovery within 3 years, would you be willing to install such key cards if this would cost to you in total...€?*.

The third scenario was about the A/C maintenance. It was asked if the A/C have been maintained at least annually for those who had not maintained them a further question was asked "Regular annual maintenance *costs 20€ per bed/room and result in annual energy savings of 25€, as well as prolonging the economic lifetime of the unit. Would you be willing to have the A/C annually maintained?"*. Next it was asked if A/C inverter technology had been installed in the hotel and for those who had not installed it a further question was asked "*The use of air condition inverter technology and energy class A costs 230€ or more (+25%) resulting in cost savings of up to 55% and capital recovery within about 3 years gaining 70€/year in energy saving compared to an air conditioning without inverter technology and energy class D. In case of partial or total renovation of the A/C units would you be willing to buy inverter technology and A class A/C units if this would cost...€ more compared to conventional units?*.

Then it was asked if the hotel had water solar heaters for those who didn't have them a further question was asked: "The installation of solar water heaters costs 380€ per room. Considering energy saving per season of 70€ per bed and a subsidy of 40%, the capital is recovered within 3.5 years. Are you willing to install solar water heaters if this would cost in total...€". The reported subsidy was consistent with subsidies from the Greek government at the time of the questionnaire.

Then it was requested by the hoteliers to report what would be the recommended means to speed up the adoption of renewable energy and energy saving technology. Their response options were: conferences, printed material/leaflets, specific information and subsidies. Then it was asked if they would be willing to apply a formal environmental management system. The fourth part involved information for hotels and managers.

## 3. Results and discussion

With use of SPSS Software the collected data was analyzed. Three binary logistic regression models were estimated aiming to identify those variables that affect hoteliers' decisions on energy issues. The variables of the models are summarized in Table 1, followed by their mean values and their standard deviation. The results show that 33% of the hoteliers had tertiary education, 63.7% of the hoteliers agreed that an important factor for profitability of their hotels is efficient energy management. Furthermore, 68.1% of the hoteliers considered themselves much or very much informed about energy savings and 80.2% reported that electricity cuts affected the hotel operation much or very much. Just 24.2% of the hotels were established after 2000.

**Table 1**
Descriptive statistics of variables.

| Variable | Description | Mean | Standard deviation |
|---|---|---|---|
| EDU1 | Education level: 0 = secondary education or less; 1 = tertiary education | 0.330 | 0.473 |
| SPROF1 | Efficient energy management is important factor for profitability of hotel: 0 = disagree; 1: agree | 0.637 | 0.483 |
| INFOS1 | Stated level of information about energy savings: 0: little or very little informed; 1: very much or fully informed | 0.681 | 0.469 |
| BAI1 | How affect your hotel operation the electric cuts: 0: very little or little; 1: much or very much | 0.802 | 0.400 |
| STAR | Hotel stars: one to five | 2.67 | 0.775 |
| YEAR1 | Date of hotel construction: 0: before 2000; 1: after 2000 | 0.242 | 0.431 |

Concerning the electricity cuts, 24.2% of the respondents reported that there were electricity cuts 2–5 times per year, 26.4% 5–10 times per year, while the remaining 49.4% stated that they occurred more than 10 times per year. Twelve hotels (13.2%) had installed back up electricity generators and 10 of them stated that they were willing to use back up electricity generators in order to avoid a general electricity breakage. Fifty-six hotels (61.5%) had installed gas in the kitchen. A summary of all estimated models is presented in Table 2.

Although the binary regression models can calculate the probability of what the dependent variable expresses, in relation to significant independent variables.

### 3.1. Energy saving lamps

Sixty-nine 69 (79%) of the respondents had installed energy saving lamps. For the remaining hoteliers, 19 (21%) stated that they willing to install energy saving lamps after the information session (Fig. 1). Similar to this finding, in Singapore over 50% of the hotels had installed energy saving lamps [2].

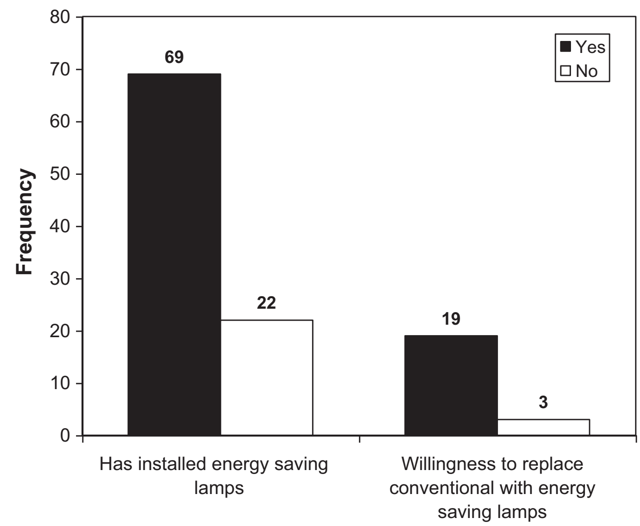



**Fig. 1.** Hoteliers who had installed energy saving lamps and willingness to install them for those who had not.

### 3.2. Electronic key

Most hotels (81%) had electronic key cards. Furthermore, 7 (10%) of the remaining hoteliers were willing to install electronic key cards (Fig. 2). Ustad [17] identifies that some hoteliers of New Zealand hotels support that the installation of key cards can lead to energy saving. Erdogan and Baris [13] report that 80% of the managers of four-star hotels in Ankara use, among other energy management practices, key-card systems, while 57.2% of the managers of five-star hotels and 39.7% of the managers of three-star hotels have adopted key card system.

### 3.3. A/C maintenance

Fig. 3 shows that 79 (86.1%) of the hoteliers had the A/C maintained at least once per year. After the information session, all remaining hoteliers stated that they were willing to undertake an annual maintenance of their A/C. This is an expected finding because the hotels are located in a warm area and the air-conditioning units are heavily used resulting in significant part of the overall electricity consumption of the hotels in such areas due to the high temperatures associated with high energy uses for cooling [2]. Thus, the annual maintenance of air-conditioning units will improve energy performance and offer hoteliers energy and cost savings (win-win).

**Table 2**
Summary of the estimated binary regression models.

| Model code | Description of dependent variable | Values |
|---|---|---|
| M1 | Willing to install inverter air condition technology | 1: Yes; 0: No |
| M1 | Willing to install solar water heaters | 1: Yes; 0: No |
| M3 | Willing to adopt formal environmental management systems to face energy issues | 1: Yes; 0: No |

### 3.4. Inverter A/C technology

It is remarkable that when initially asked, 76.2% of those having A/C reported that they did not even know their energy class. As reported in Fig. 4, 26 hotels had installed inverter A/C. From the remaining 58 hoteliers, 20 stated that they were willing to do so in the next purchase. Variables affecting this statement “i.e. to install

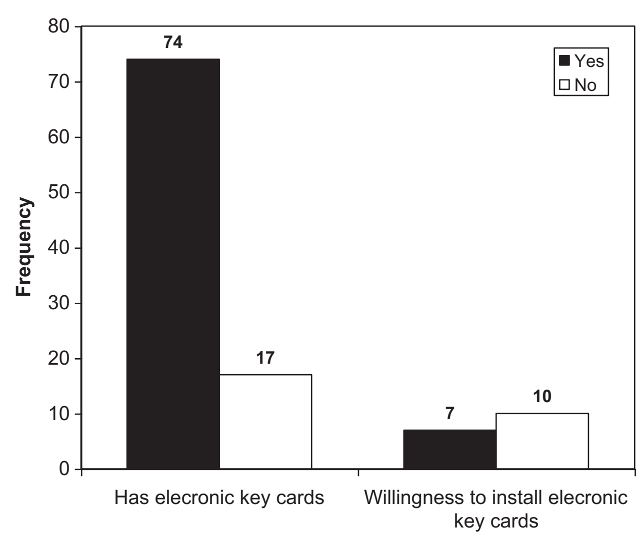



**Fig. 2.** Hoteliers who had installed electronic key cards and willingness to install electronic key cards for those who had not.

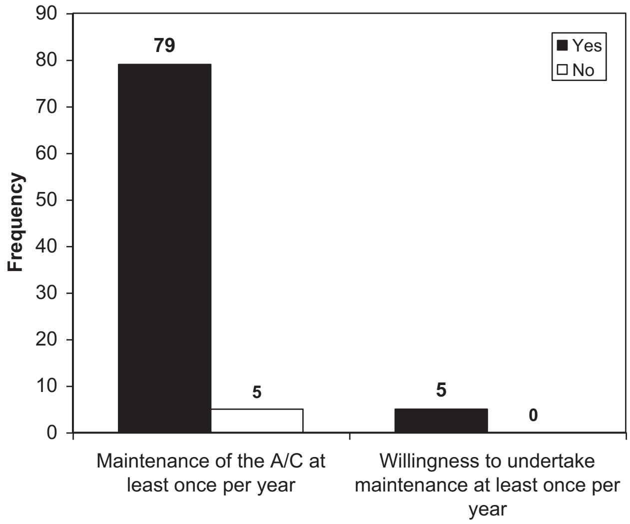



**Fig. 3.** Annual maintenance of the A/C units and willingness to do so.

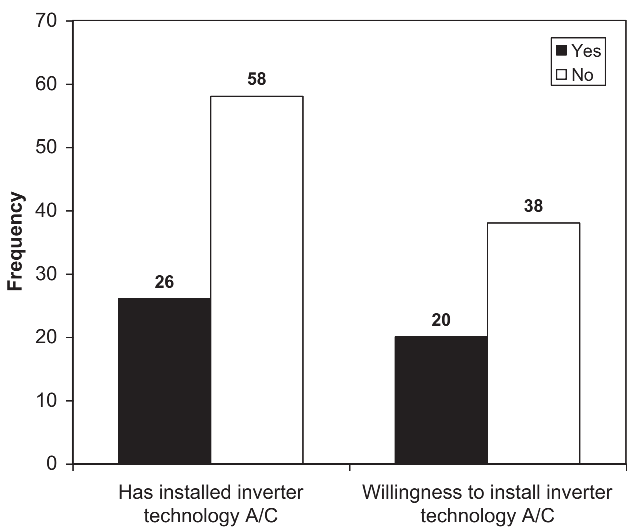



**Fig. 4.** Number of hotels that had installed inverter A/C and willingness to install them for those who had not.

inverter A/C" were possible to be modeled according to the scenario described in research methodology as reported in Table 3.

Respondents who considered themselves as fully or very much informed about energy saving (INFOS1) were more probable to be willing to install inverter A/C ($\hat{\beta} = 2.034$, $p = 0.014$). Furthermore, managers of those hotels affected much or very much by electricity cuts (BAI1), were more probable to be willing to install inverter A/C ($\hat{\beta} = 2.138$, $p = 0.055$).

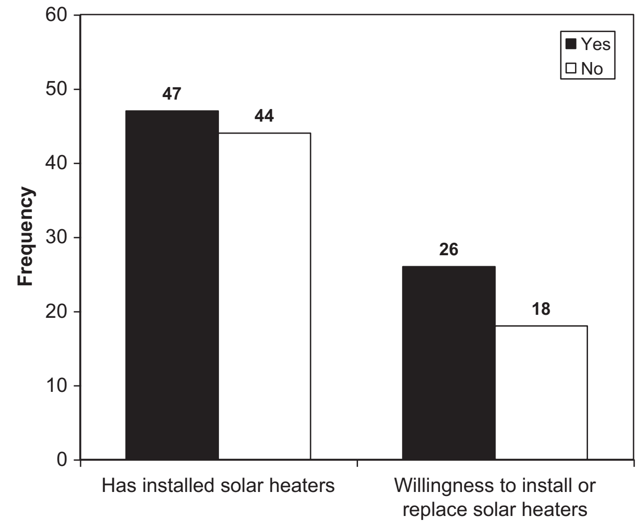



**Fig. 5.** Number of hotels that had installed water solar heaters and willingness to install them for those who had not.

### 3.5. *Solar water heaters*

Just over half (47) of the hotels had installed water solar heaters (Fig. 5). From the remaining, 26 stated that they were willing to install solar water heaters according to the scenario reported in the methodology session. Variables affecting this statement "i.e. willingness to install solar water heaters" were able to be modeled according to the scenario described in the research methodology as reported in Table 4.

Table 4 shows factors that explain the willingness of hoteliers in Corfu, Greece to use solar water heaters. Those who agreed with the statement that efficient energy management is an important factor for profitability (SPROF1) were more probable to be willing to install solar water heaters compared to those who disagreed with this statement ($\hat{\beta} = 1.430$, $p = 0.067$).

It was more probable for respondents of tertiary education (EDU1) to be willing to install solar heaters compared to those of a lower level of education ($\hat{\beta} = 2.095$, $p = 0.020$). This finding supports previous research by Ek [18], who identified that those with tertiary education have a greater possibility of installing solar heaters since they are more conscious of environmental issues.

### 3.6. *Recommended mean for faster renewable energy and energy saving technology intrusion*

Economic incentives would accelerate the decision of hoteliers to adopt energy saving technology [21]. Fig. 6 shows that 88 (96%) of the respondents supported that subsidy is a very important incentive for faster energy saving technology intrusion in the hotels, 25 (27.5%) requested specific information about energy management and environmental management systems. Finally, only 4 (2.2%) and 2 (4.4%) of the respondents supported awareness through printed

**Table 3**
Estimated results for model M1 ($n = 58$).

| Variables and statistics | $B$ | Wald $X^2$ | $p$ |
|---|---|---|---|
| C | –4.040 | 9.370 | 0.002 |
| INFOS1 | 2.034 | 5.980 | 0.014 |
| BAI1 | 2.138 | 3.684 | 0.055 |
| Pseudo $R^2$ | | 0.195 | |
| −2LL | | 62.155 | |
| Hosmer and Lemeshow test | | 0.058 | 0.971 |
| Overall predictive accuracy | | 69% | |

**Table 4**
Estimated results for model M2 ($n = 44$).

| Variables and statistics | $B$ | Wald $X^2$ | $p$ |
|---|---|---|---|
| C | −1.168 | 2.730 | 0.098 |
| EDU1 | 2.095 | 5.388 | 0.020 |
| SPROF1 | 1.430 | 3.350 | 0.067 |
| Pseudo $R^2$ | | 0.208 | |
| −2LL | | 49.277 | |
| Hosmer and Lemeshow test | | 0.060 | 0.971 |
| Overall predictive accuracy | | 71% | |

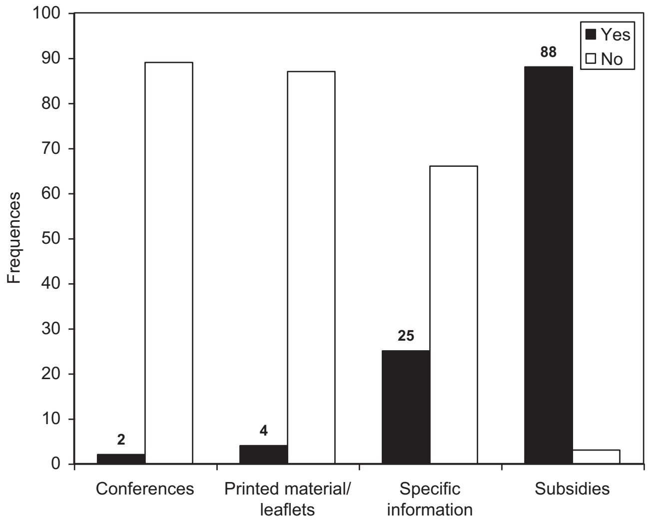



**Fig. 6.** Recommended mean for faster renewable energy and energy saving technology intrusion in the hotels by their managers.

materials and conference sessions respectively. This finding is in accordance with Dalton et al. [20], who identified that the most important consideration of hoteliers in order to adopt renewable energy savings is the economic viability and subsidies.

### *3.7. Environmental management systems*

A very small number of hotels had installed ISO14001 at the time of the survey (Fig. 7). However, 33% of the hoteliers stated that they were willing to adopt a formal Environmental Management Systems (e.g. ISO 14001 or EMAS). In Table 5 the variables that affect this willingness are reported.

The higher the quality category of the hotel expressed in number of stars (STAR) the more probable the manager to be willing to adopt environmental management systems ($\hat{\beta} = 1.820$, $p = 0.002$). Managers from hotels constructed before 2000 (YEAR1) were more probable to be willing to adopt environmental management systems ($\hat{\beta} = -3.033$, $p = 0.008$). Those who believed that efficient energy management is an important factor for profitability of a hotel (SPROF1) and those who stated fully or very much informed about energy saving (INFOS1) were more probable to be willing to adopt environmental management systems ($\hat{\beta} = 1.837$, $p = 0.033$ and $\hat{\beta} = 3.201$, $p = 0.023$, respectively). Zografakis et al. [19] identified that 68.75% of 32 hoteliers in an area of Crete were willing to implement environmental management systems to face energy issues. Finally, tertiary educated managers (EDU1) were more probable to be willing to adopt environmental management systems ($\hat{\beta} = 1.702$, $p = 0.047$), compared to those with lower levels of education.

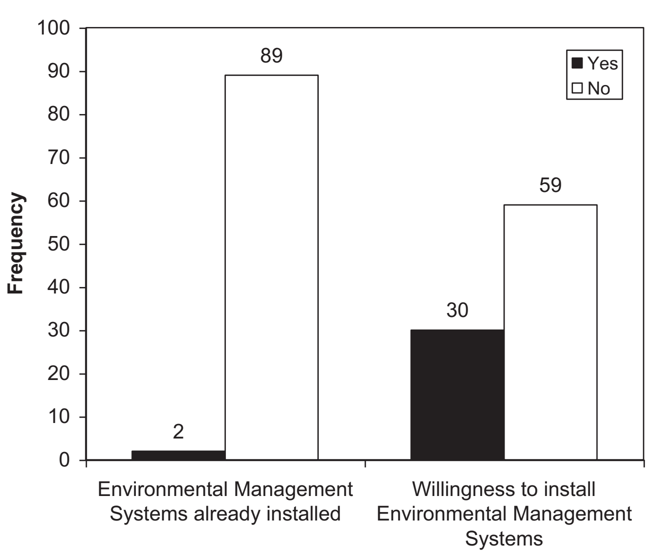



**Fig. 7.** Number of hotels that had installed water solar heaters and willingness to install them for those who had not.

**Table 5**
Estimated results for model M3 ($n = 89$).

| Variables and statistics | $B$ | Wald $X^2$ | $p$ |
|---|---|---|---|
| C | −10.499 | 17.958 | 0.000 |
| STAR | 1.820 | 9.403 | 0.002 |
| YEAR1 | −3.033 | 7.090 | 0.008 |
| INFOS1 | 3.201 | 5.205 | 0.023 |
| SPROF1 | 1.837 | 4.540 | 0.033 |
| EDU1 | 1.702 | 3.942 | 0.047 |
| Pseudo $R^2$ | | 0.484 | |
| −2LL | | 55.107 | |
| Hosmer and Lemeshow test | | 10.315 | 0.171 |
| Overall predictive accuracy | | 83.5% | |

## 4. Conclusion

Energy efficiency is a very important factor for the tourist industry. This work explores the willingness of 91 hoteliers in Corfu Island, Greece to install technological equipment or adopt formal environmental systems in order to have energy and cost savings. The results show that 79% of them had installed energy saving lamps, 81% had electronic key cards, 31% had inverter A/C technology, 52% has solar water heaters and less than 2% had ISO 14001 certification. These figures show that there is place for energy and management improvements. This can be achieved if proper information and fiscal incentives are applied.

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